

Galactic Observer

John J. McCarthy Observatory

Volume 8, No. 6

June 2015

***Jeepers Creepers!
Where'd You
Get Those
Peepers ?***

***Hubble: Nearly Blind
at Birth, But at
25, still Unveiling
Secrets of the
Universe***



In celebration of Hubble's silver anniversary, NASA is taking a fresh look at the Pillars of Creation - a star-forming region 6,500 light years away in the Eagle Nebula, with a towering plume of dust stretching more than a light year into the surrounding heavens. For more on the Hubble space telescope, go to pages 3, 9 and 16.

Image Credit: NASA, ESA, and The Hubble Heritage Team (STScI / AURA)

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It is through their efforts that the McCarthy Observatory has established itself as a significant educational and recreational resource within the western Connecticut community.

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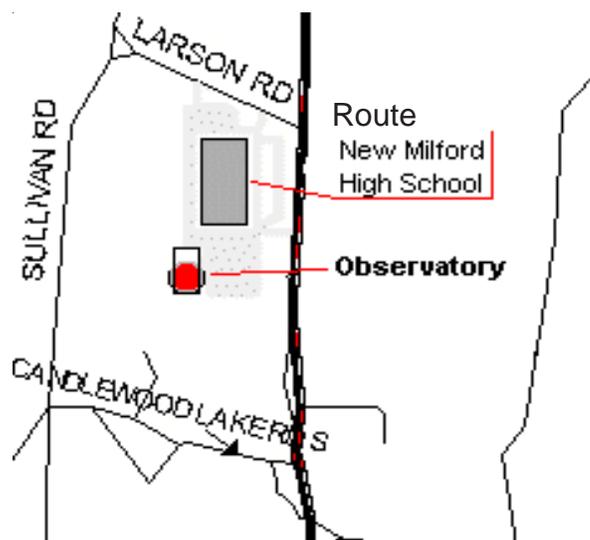
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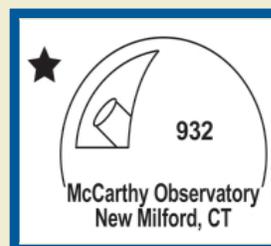
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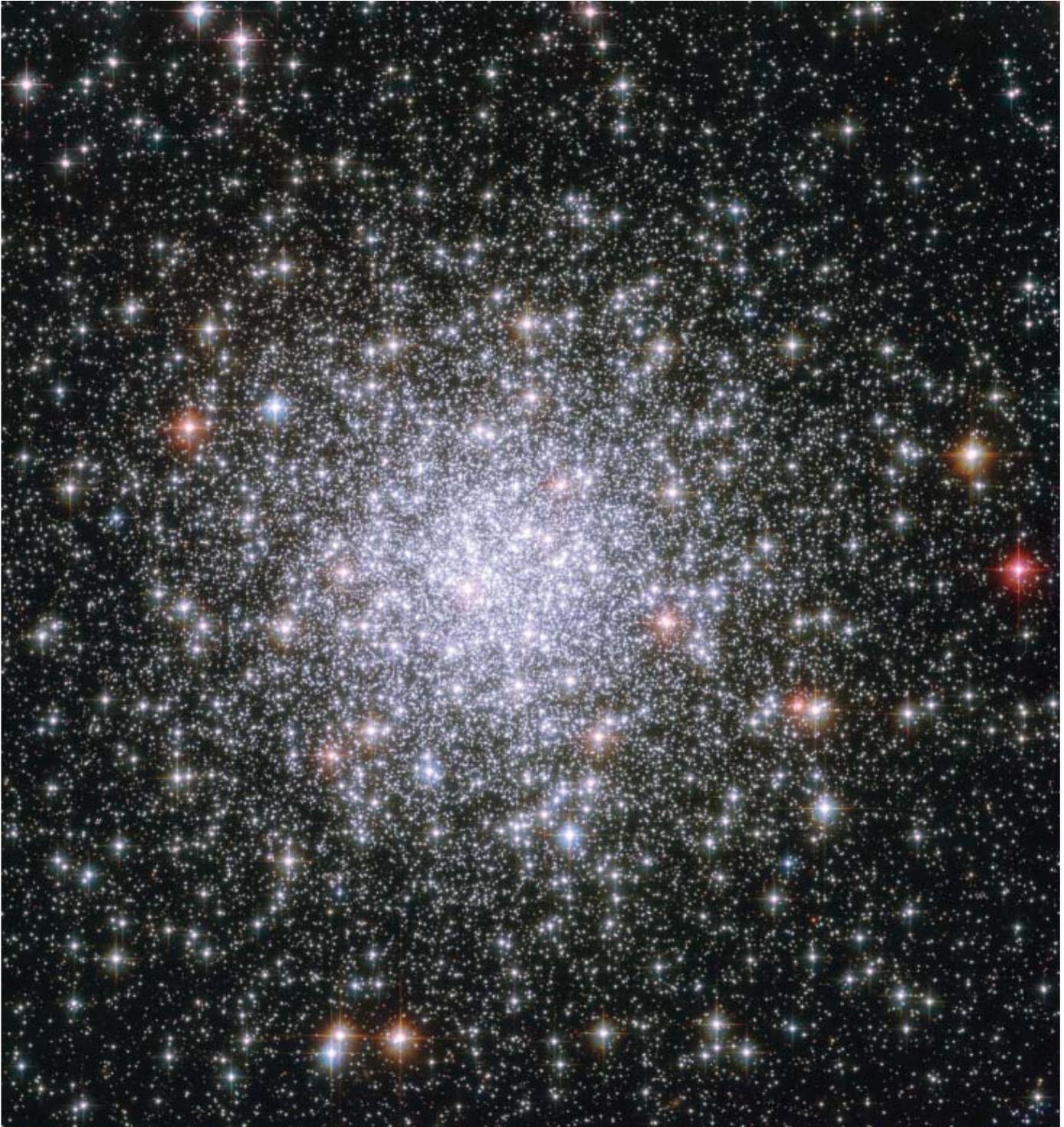


In This Issue

OUT THE WINDOW ON YOUR LEFT	4	SUNRISE AND SUNSET	13
SCHILLER AND HAINZEL	4	SUMMER NIGHTS	14
SATURN	5	ASTRONOMICAL AND HISTORICAL EVENTS	14
FINAL APPROACH	6	REFERENCES ON DISTANCES	16
4,000 SOLS	7	INTERNATIONAL SPACE STATION/IRIDIUM SATELLITES	16
CERES	8	SOLAR ACTIVITY	16
MESSENGER FAREWELL	9	COVER PHOTO	16
25TH ANNIVERSARY	10		
DRAGON LAUNCH ABORT TEST	10		
FALCON'S FIRST STAGE ATTEMPTED LANDING ON REENTRY	11		
DEVELOPING A REUSABLE ROCKET	11		
BLUE ORIGIN	11		
BLUE SUNSET	11		
SUMMER SOLSTICE	12		
JUNE HISTORY	12		
WOMEN IN SPACE	12		
AN EXTRAORDINARY FEAT	13		



June Astronomy Calendar and Space Exploration Almanac



Hubble Image of NGC 6637 (also known as Messier 69)
Globular clusters are prime observing targets in the summer
as we look into the heart of the Milky Way Galaxy

"Out the Window on Your Left"

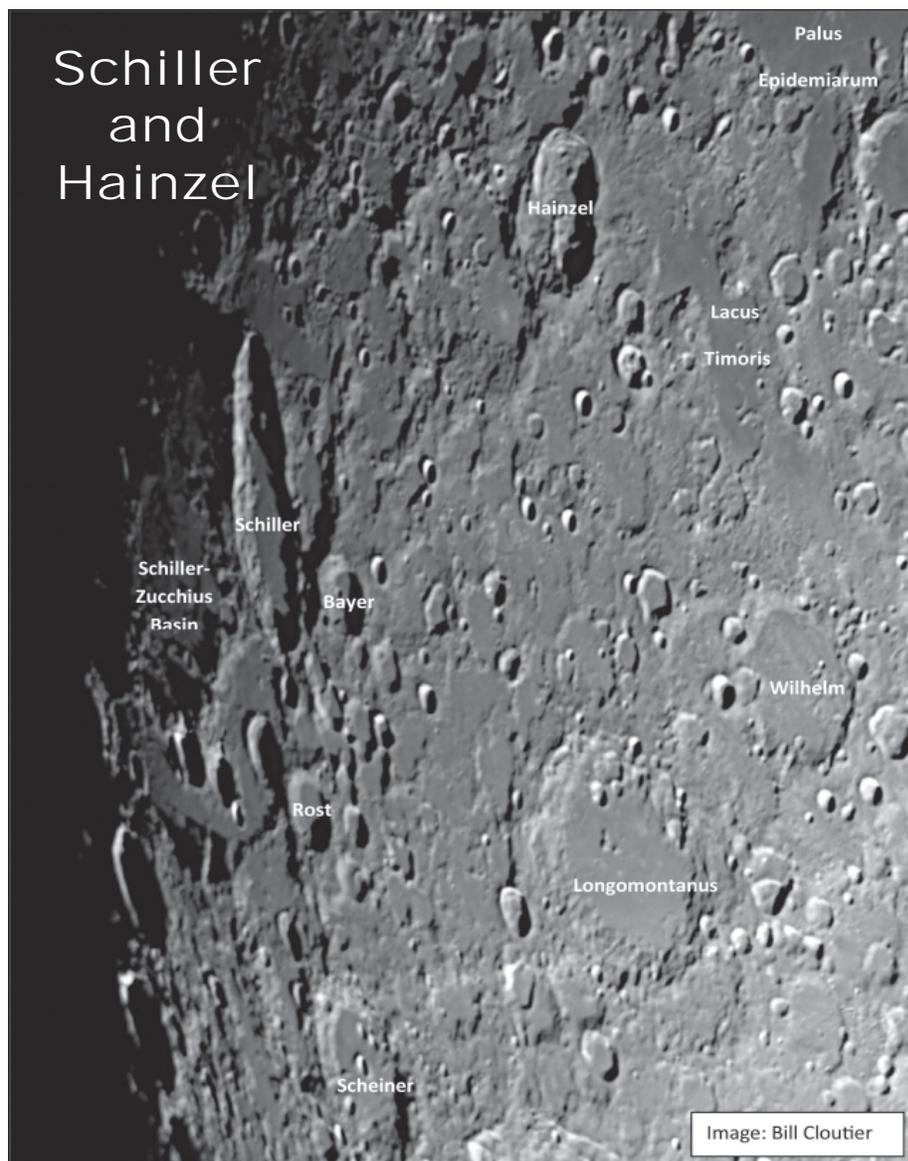
IT'S BEEN OVER 40 years since we left the last footprint on the dusty lunar surface. Sadly, as a nation founded on exploration and the conquest of new frontiers, we appear to have lost our will to lead as a space-faring nation. But, what if the average citizen had the means to visit our only natural satellite; what would they see out the window of their spacecraft as they entered orbit around the Moon? This column may provide some thoughts to ponder when planning your visit (if only in your imagination).



Lunar "lakes," "marshes" and "seas" are actually expansive, low-lying plains formed by ancient lava flows

Our spaceship of the imagination passes over the cratered ruins of the Moon's limb in this month's image. Southwest of Mare Nubium (Sea of Clouds), in an area known as Terra Caloris (Land of Heat) on 17th century lunar maps, lie the remnants of an ancient impact basin, several small maria (basaltic plains), and the Moon's battered highlands.

Crater Schiller is easily identified by its elongated proportions. With a length of 112 miles (180 km) and a width of 44 miles (70 km), Schiller is believed to have been created by a low angle impact that produced a series of overlapping gouges. The floor of Schiller is obscured by a layer of relatively smooth material, presumed to be



the fluidized ejecta from an impact that created Mare Orientale to the west; however, volcanism hasn't been completely ruled out.

Crater Hainzel is the site of three overlapping impact craters, Hainzel, Hainzel A and Hainzel C, with Hainzel the largest, oldest and least defined of the three. Hainzel A is the terraced crater to the north and most complete, suggesting that it was created last since it breaches the outer wall of Hainzel C, the smaller and heavily shadowed crater. The sloping topography of Hainzel A suggests that, it too, may have been formed by an oblique impact.

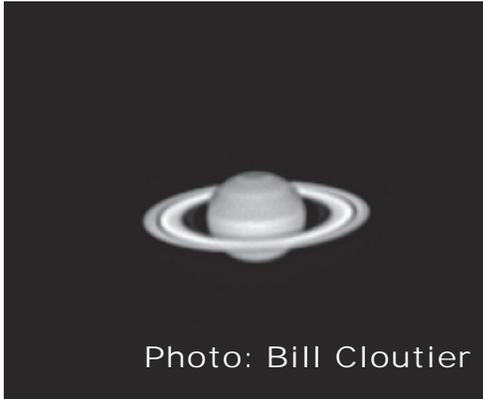
Nearby are two patches of mare, the smaller Lacus Timoris (Lake of

Fear) and larger Palus Epidemiarum (Marsh of Epidemics). Lacus Timoris is confined and bounded by mountainous ridges, while Palus Epidemiarum extends its reach to the southwestern shore of Mare Nubium to the north.

Emerging from the shadows is the ghostly Schiller-Zucchius Basin, an ill-defined pre-Nectarian impact site (estimated to have formed prior to the 3.92 billion year old impact that created the Nectaris Basin). Reconstruction of the basin's rim (erased by later impacts and ejecta) suggests an outer diameter of 208 miles (335 km). The best time to view this region is 3 to 4 days before a Full Moon.

Saturn

While the distance between the Earth and Saturn is increasing, the ringed planet is still well placed for evening observers in June. As shown on the sky map below, Saturn can be found in the constellation Libra, just west of Scorpius.

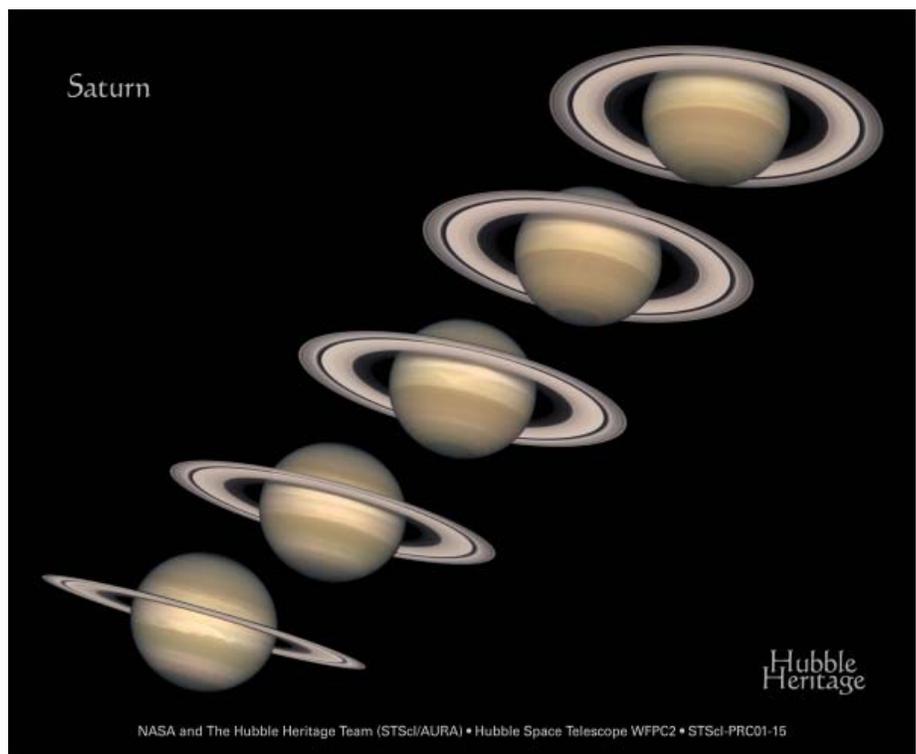
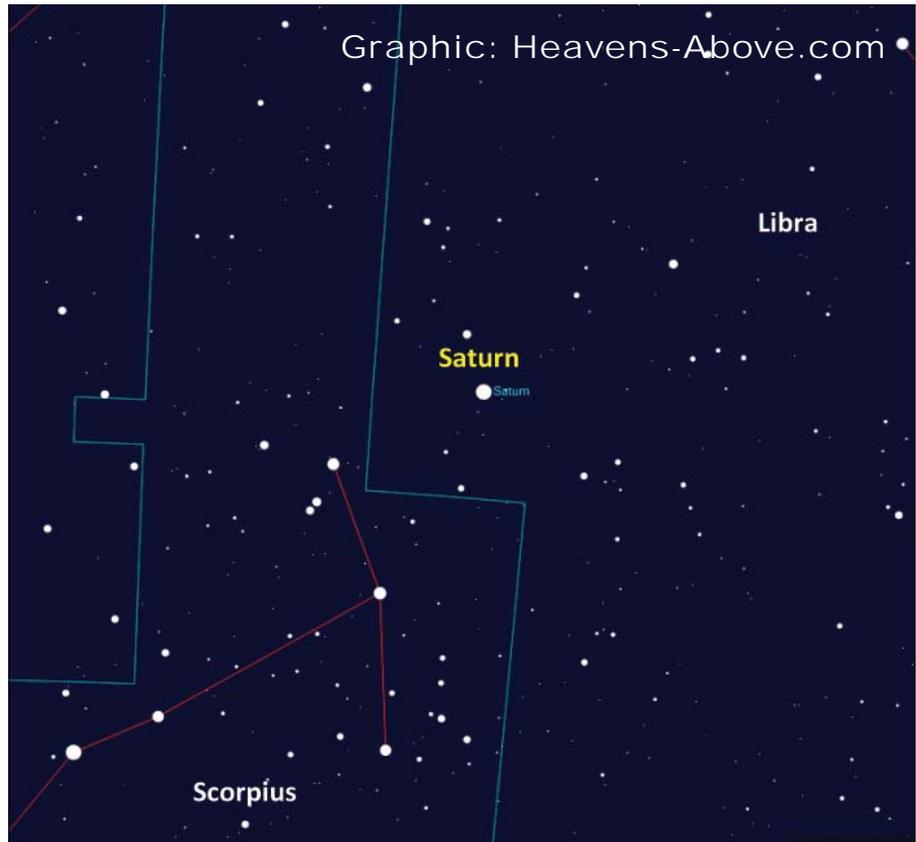


Saturn's axial tilt is almost 27° (as compared to Earth's 23.5° or Jupiter's 3°). The axial tilt produces seasons which last more than 7 years, since it takes Saturn almost $29\frac{1}{2}$ years to complete an orbit around the Sun. It was summer in the southern hemisphere when the Cassini spacecraft arrived in 2004 with the planet's north pole in perpetual darkness. Saturn's Vernal equinox occurred in August 2009 with both hemispheres experiencing equal amounts of sunlight. At the equinoxes, the rings appear almost edge on. Since that time, our view of the rings has improved. At the northern summer solstice in May of 2017, the rings will be wide open with the planet's north pole sunlit and tipped towards Earth. This year the ring tilt is 24.4° , for a view almost as good as it gets.

June 30th marks the 11th anniversary of the arrival of the Cassini spacecraft in the Saturnian system. Its mission will end in 2017, with the spacecraft passing through the gap between the planet and its innermost ring on several orbits before taking a fi-

nal plunge into Saturn's atmosphere, a campaign dubbed "The Grand Finale." The close encounters will provide valuable data

on the ring's composition, the planet's magnetic field and any variations in Saturn's gravitational field.



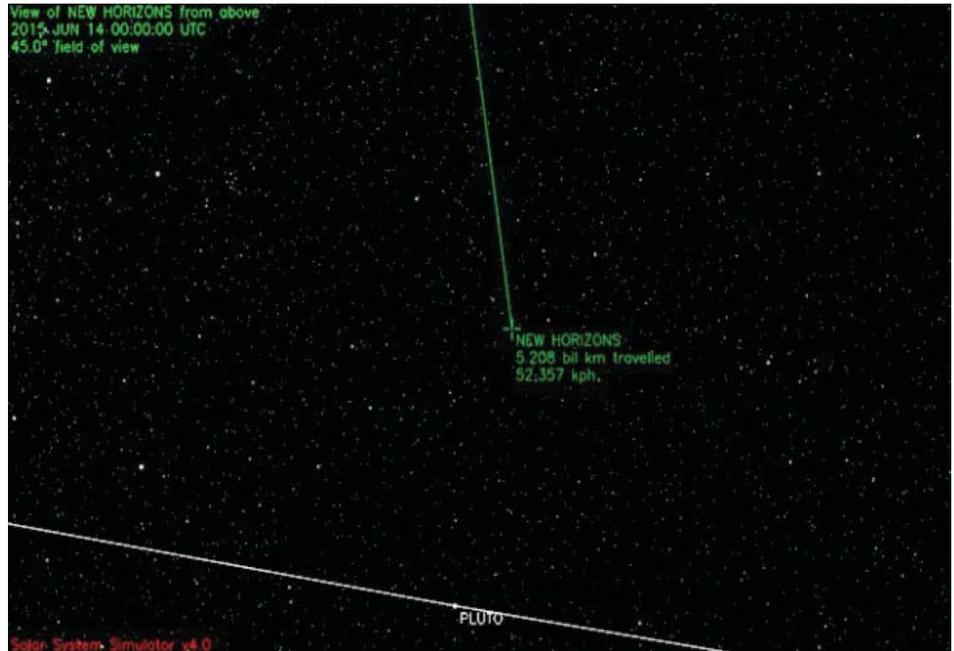
Hubble images of Saturn taken from 1996 through 2000 (L to R). Image Credit: R. G. French (Wellesley College) et al., NASA, ESA, and The Hubble Heritage Team (STScI/AURA)

Final Approach

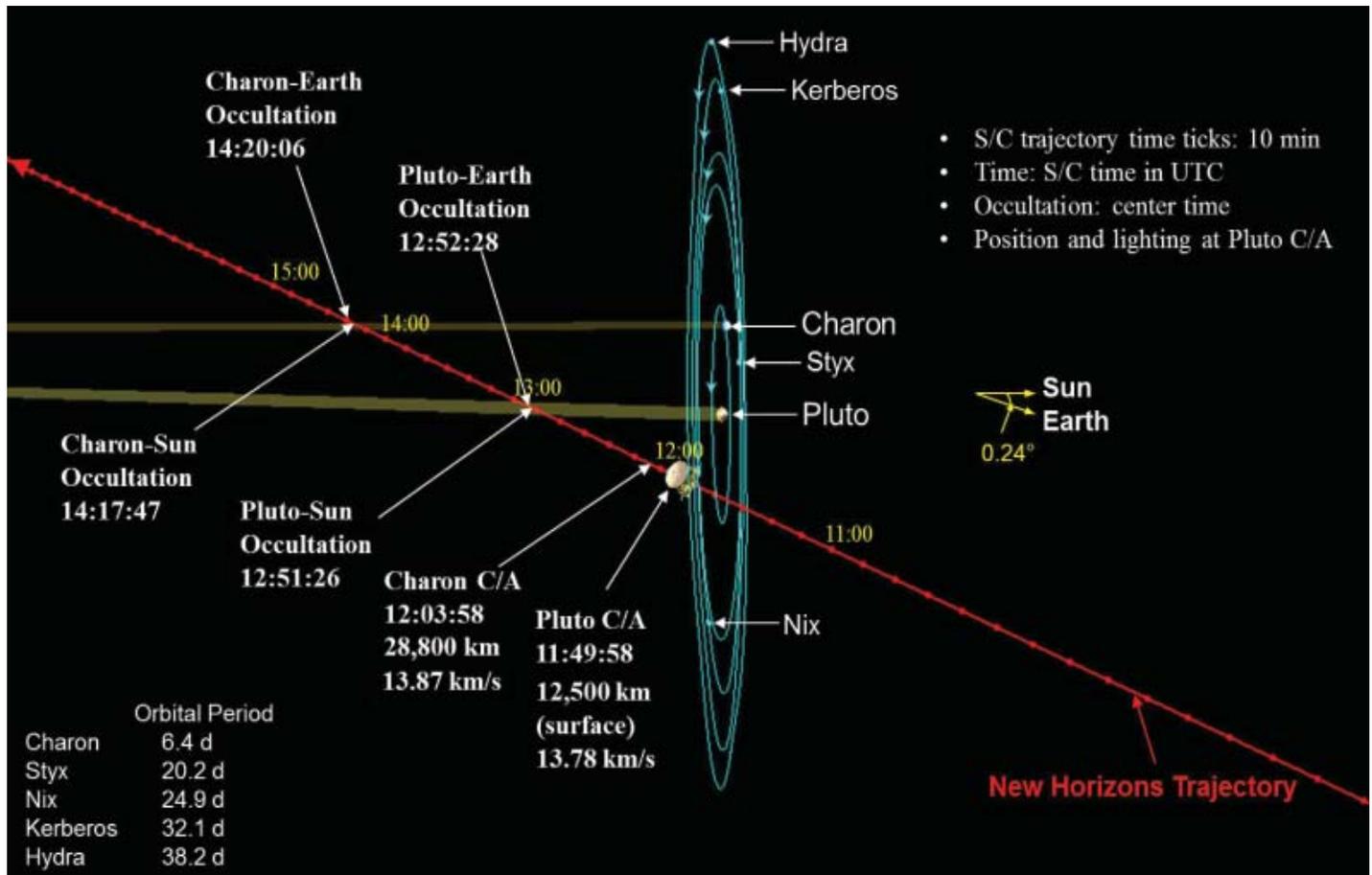
NEW HORIZONS IS in the second of three “approach” phases as the spacecraft prepares for its close encounter with Pluto and Pluto’s five



moons on July 14th. The current phase, which lasts until June 23rd, is focused on detecting additional moons or any debris in and around Pluto that could pose a hazard to the fast moving spacecraft (traveling at a speed of more than 31,000 miles per hour (50,000 km/h)).



New Horizons' Position on June 14th with respect to Pluto. JPL's Solar System Simulator <http://space.jpl.nasa.gov/>



July 14th Timeline: NASA/JHUAPL

4,000 Sols



Spirit of St. Louis crater. Image credit: NASA/JPL-Caltech/Cornell Univ./Arizona State Univ.



Rocky Spire in the Spirit of St. Louis crater. Image credit: NASA/JPL-Caltech/Cornell Univ./Arizona State Univ.



Curiosity's position (green star) imaged by the Mars Reconnaissance Rover on April 18, just past its 10th kilometer and in its 957th Martian day (sol) on the planet's surface. Credit: NASA/JPL-Caltech/Univ. of Arizona

The Mars Exploration Rover “Opportunity” landed on the plains of Meridiani Planum on January 25, 2004, three weeks after its twin rover, Spirit touched down in Gusev Crater. Opportunity has been exploring Mars for more than 4,000 Martian days or Sols.

In August 2011, after a nearly a three year trek from Victoria crater, Opportunity arrived at the rim of the 14-mile (22 km) diameter Endeavour crater. The crater is believed to date from Mars’ Noachian Period, lasting between 3.6 and 4.2 billion years ago, when conditions on Mars are believed to have been wetter and warmer. Since arriving, Opportunity has been working along the crater’s western rim. The rover is currently exploring an elongated crater called “Spirit of St. Louis,” located at the entrance of “Marathon Valley,” a gap in the Endeavour’s rim wall and a site targeted by orbiting spacecraft that have detected the presence of clay minerals.

Spirit of St. Louis crater is a shallow depression, approximately 110 feet (34 meters) long and 80 feet (24 meters) wide. A rock spire at one end of the crater rises 7 to 10 feet (2 to 3 meters) above the crater rim.

Ceres

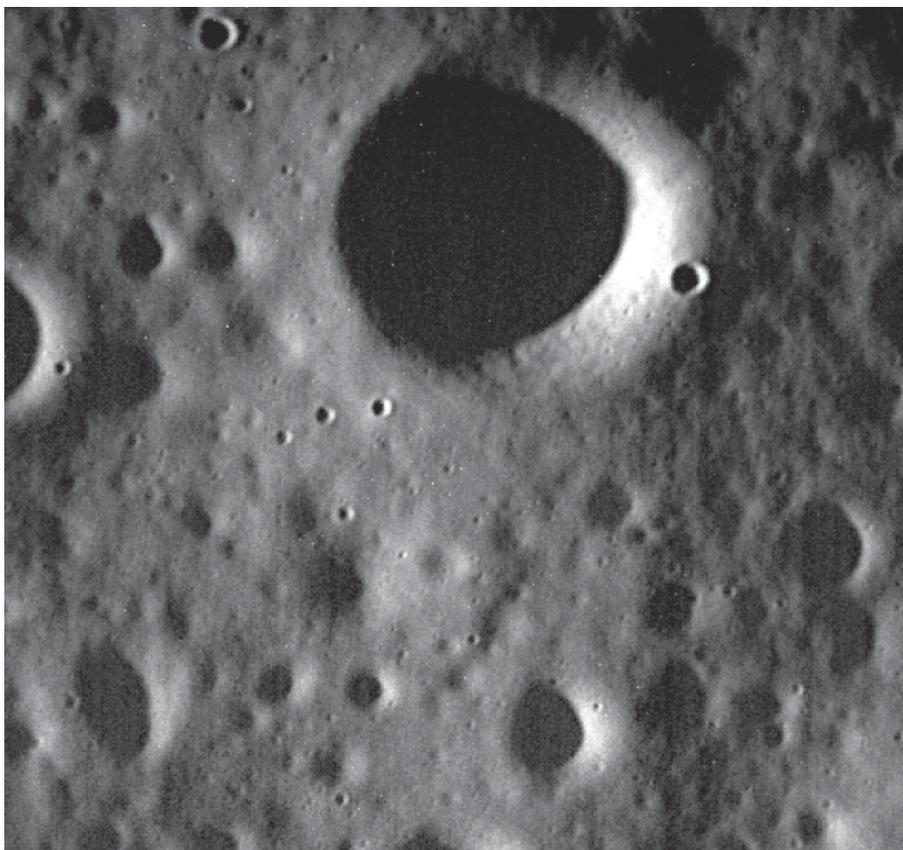
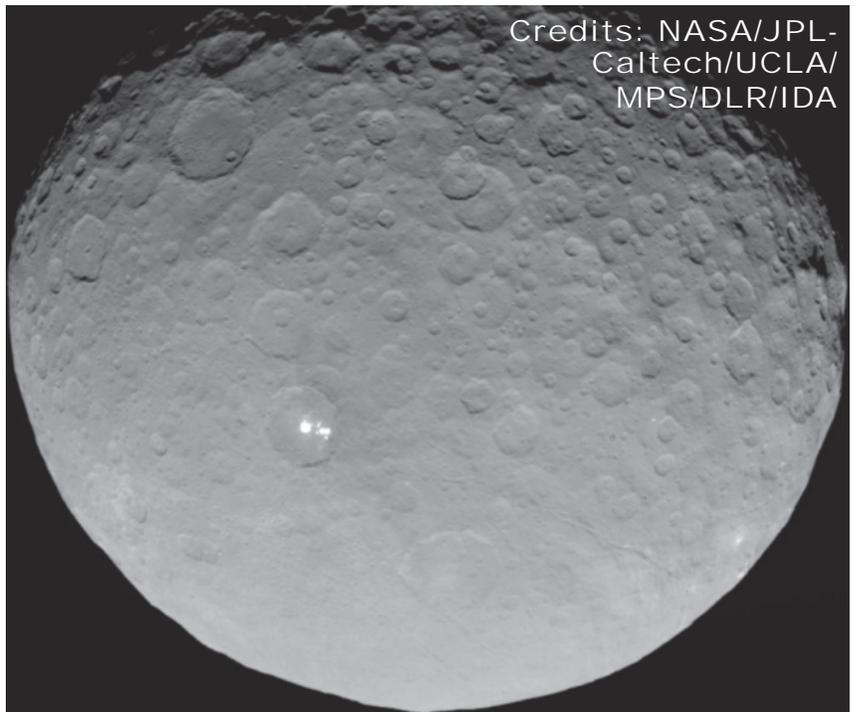
NASA's Dawn spacecraft completed its first of four mapping orbits from a distance of 8,400 miles (13,500 km) in early May. With each successive orbit, the spacecraft moves in closer to the dwarf planet. Dawn has since restarted its ion engines and is moving into its second orbit. It is expected to reach its new orbit on June 6th and will spend approximately three weeks at the 2,700 mile (4,400 km) altitude. The final two orbits (at 900 miles or 1,450 km and at 230 miles or 375 km) are planned for August through October and December to mission end, respectively. At its lowest orbit, Dawn will be circling Ceres once every 5½ hours.

The image (right) includes one of the mysterious bright spots on the planet, and was taken from a distance of 8,400 miles (13,500 km) in early May. The bright, reflective material

is possibly ice within the crater, although its source remains a mystery.

Launched in September of 2007. The spacecraft received a gravity assist from Mars in 2009 before its ren-

dezvous with the asteroid Vesta in 2011. It spent 14 months in orbit around Vesta between 2011 and 2012 before making its way to Ceres, and will remain in orbit around Ceres at mission end.



One of the Last Images Returned by MESSENGER Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington

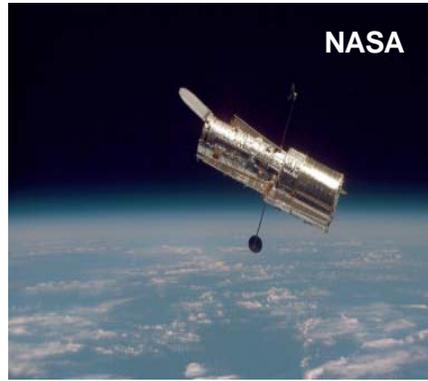
MESSENGER Farewell

The MESSENGER spacecraft's mission came to an abrupt end when it impacted the planet Mercury on April 30th after running out of fuel. In the four years spent studying Mercury, the spacecraft completed more than 4,000 orbits of the innermost planet and transmitted almost 300,000 detailed images back to Earth. MESSENGER's impact created a new crater on the planet, estimated to be up to 52 feet across.

Mapping the surface of Mercury was only one of many accomplishments. The spacecraft's suite of instruments returned data on the planet's composition and geologic Mercury's magnetic field was off-set from the planet's center, and confirmed the presence of water ice within the permanently shadowed craters at the planet's poles. MESSENGER continued to provide data and transmit images on its final approach. The largest crater (below) is approximately 1,100 feet (330 meters) across.

Hubble 25th Anniversary

The Hubble Space Telescope was launched on April 24, 1990, carried to orbit in the payload bay of the space shuttle Discovery. After five servicing missions by four different space shuttles, the telescope is a much more capable instrument than when it was launched 25 years ago. Since 1990, Hubble has made more than 1.2 million observations. During the last servicing mission in 2011, requiring five space walks, two new instruments were installed, two inoperative instruments repaired, all the original batteries replaced, six new gyroscopes (used to point the telescope) installed, insulation



This photograph of Hubble Space Telescope was taken on the second servicing mission to the observatory in 1997.

replaced and other maintenance performed. The telescope is performing flawlessly, and is expected to be operational when its succes-

or, the James Webb Space Telescope, is launched in October 2018.

For the telescope's silver anniversary, NASA released an image of a large cluster of approximately 3,000 stars called Westerlund 2. The cluster is located in the constellation Carina at a distance of approximately 20,000 light years. Westerlund 2 is a relatively young cluster (about 2 million year old) and contains some of the galaxy's hottest and most massive stars. The intense radiation and high-speed solar wind from these massive stars is sculpting the hydrogen cloud enveloping the cluster into the pillars of gas and dust seen in the photo.



The image of Westerlund 2 was captured by Hubble's Wide Field Camera 3 and its Advanced Camera for Surveys, combining near-infrared with visible light images (credit: NASA, ESA, the Hubble Heritage Team (STScI/AURA), A. Nota (ESA/STScI), and the Westerlund 2 Science Team).

Dragon Launch Abort Test

On May 06, 2015, SpaceX completed a critical milestone in demonstrating that its Dragon space capsule could safely carry astronauts away from the rocket booster in the event of a launch failure. In a pad abort test, the Dragon's eight SuperDraco engines ignited and carried the unmanned capsule to a top speed of 346 mph and to an altitude of nearly 3,900 feet before returning to Earth by parachute. The 99 second test flight carried the capsule three quarters of a mile from Launch Complex 40 (SLC-40) at Cape Canaveral to the waters of the Atlantic Ocean. SpaceX is working towards a 2017 date for being astronaut ready.

The SuperDraco engines were manufactured with cutting edge technology and are designed to produce enough thrust to enable the capsule to execute a controlled landing on

land or sea. The engine's combustion chambers were manufactured by a 3D printing process using direct metal laser sintering. The process uses lasers as a heat source to sinter (heat and bind) powdered metal. The combustion chambers are printed with Inconel, a nickel-chromium alloy, allowing the engines to operate at high temperatures and pressures.



Combustion Chamber Photo: Credit SpaceX

The 3D printing process creates its target by dispersing micron thick layers of the sintered Inconel in accordance with a computer generated design. The resulting product has homogeneous material properties with superior strength and fracture resistance.

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Photo Credit: SpaceX

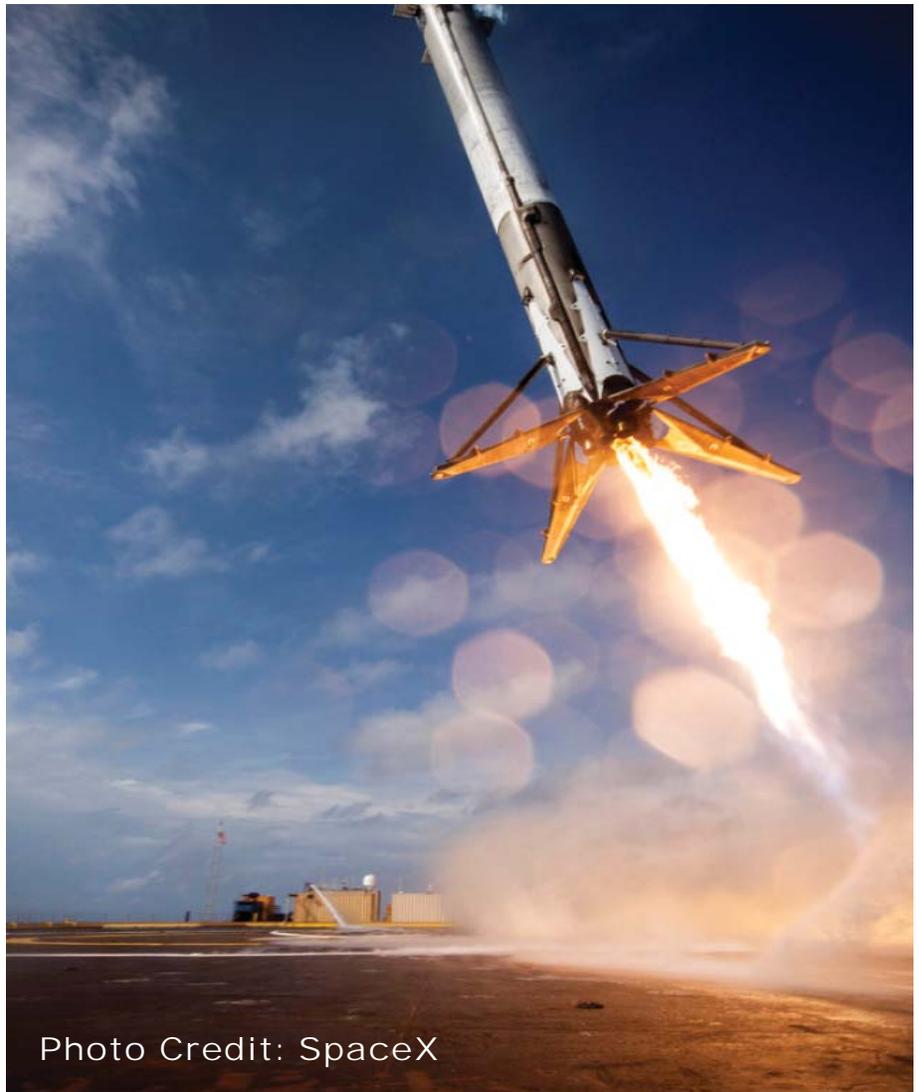


Photo Credit: SpaceX

Falcon's First Stage Attempted Landing Upon Reentry

Developing a Reusable Rocket

For only the second time, SpaceX attempted to recover the first stage of its Falcon 9 rocket by landing the booster on a barge staged 200 miles off the coast of Florida. Following the launch of a Dragon resupply mission to the International Space Station (ISS) on April 14, 2015, the Falcon 9's first stage engines were reignited to slow the rocket's reentry. SpaceX successfully guided the rocket to a football field-sized ocean barge. The rocket booster attempted to set down on the barge but could not maintain an upright configuration, tipping over and exploding on contact. Elon Musk, the company's founder and chief executive, blamed a "slower than expected throttle valve response" for the failure. SpaceX will attempt another recovery in late June when the company is scheduled to fly another ISS resupply mission.

Blue Origin

The curtain of secrecy was briefly pulled aside on April 29th as Blue Origin (owned by Amazon-founder Jeff Bezos) posted a video of the first developmental test flight of its sub-orbital space vehicle "New Shepard." The unmanned rocket climbed to an altitude of 58 miles on the thrust of its liquid hydrogen/oxygen powered BE-3 engine. The crew compartment successfully separated and returned to Earth by parachute. The rocket booster, designed to return to Earth under power, crash landed, however, due to a failure in the rocket's hydraulic system. A redesigned hydraulic system should be available for the next test flight.

Blue Origin is also working on a scaled-up version of New Shepard for orbital missions. The company's next generation BE-4 engine has been selected by United Launch Alliance to power its new Vulcan rocket.

<http://www.mccarthyobservatory.org>

New Shepard Lift-Off Credit: Blue Origin



The New Shepard vehicle is designed for sub-orbital flight, carrying three or more astronauts to an altitude above 62 miles. It will compete with other companies such as Virgin Galactic for tourists wishing to travel to the edge of space.

Blue Sunset

The molecules in the Earth's atmosphere (and particles suspended within the atmosphere) scatter the Sun's light as it passes through the air. Blue light is preferentially scattered due to its shorter wavelength (a property known as Rayleigh scattering). When the Sun is high in the sky,

blue light is scattered in all directions and the sky appears blue to the human eye. However, when the Sun is low in the sky, the Sun's light passes through more of the Earth's atmosphere. The longer light path scatters even more of the blue light, allowing the longer wavelength red and yellow light to be seen near the Sun.



NASA's Curiosity Mars rover recorded its first sunset (in color) at Gale Crater on April 15, 2015.

On Mars, the atmosphere is 100 times less dense than Earth's atmosphere. Consequently, there is very little Rayleigh scattering by Mars' carbon dioxide molecules and nitrogen gas. There is, however, a significant amount of fine dust suspended in the Martian atmosphere. The dust preferentially scatters red light. When the Sun is high in the

sky, red light is scattered in all directions and the sky takes on a pinkish hue. However, when the Sun is low in the sky, the Sun's light passes through more of the Mars' atmosphere. The longer light path scatters even more of the red light, allowing the shorter wavelength blue light to be seen near the Sun.

Summer Solstice

On the morning of June 21st the Sun will rise over a prehistoric structure on the Salisbury Plain in southern England as it has for the last 4,000 years. For those individuals standing within the 100 foot diameter circle of 30 sandstone or sarsen-stones (weighing up to 50 tons each), the Sun will appear over a large naturally shaped stone (Heel Stone) located outside and to the northeast of the circle. The alignment signals the start of the longest day, midsummer, or the summer solstice.

The photo (below) shows the current state of the stone circle. Many of the original stones are missing or damaged. Over time, they were taken to build houses and roads, chipped away by visitors and taken as souvenirs. What re-

mains represents the last in a progressive sequence of monuments erected at the site between 3,000 and 1,600 B.C. The Heel Stone (below) is adjacent to the access road to the site. The ancient people who constructed this monument left no written record of their accomplish-



Photo: Bill Cloutier



Photo: Bill Cloutier

ments or the intended use of the stone circle. Its purpose has been widely debated and many groups have attempted to claim ownership. However, archeologists have clearly shown that the construction of Stonehenge predates the appearance of most modern cultures in Britain.

In the 1960s, Gerald Hawkins, an astronomer at the Smithsonian Astrophysical Observatory, found that each significant stone aligns with at least one other to point to an extreme position of the sun or moon ("Stonehenge Decoded," Doubleday & Company). That Stonehenge is an astronomical observatory or celestial calendar is intriguing, as the precision and architectural refinement by which it was constructed certainly suggests a significant purpose for this megalithic monument.

June History

Women in Space

On June 16, 1963, Valentina Tereshkova became the first woman in space. Shortly after Yuri Gagarin's flight, the Soviets began a search for suitable female candidates for spaceflight. With few female pilots, the majority of the candidates were women parachutists



(Valentina had joined an amateur parachuting club at the age of 18). Control of the Vostok spacecraft was completely automatic, so piloting experience was not required. However, since the Vostok was not designed to return its occupant safely to Earth, the cosmonaut was required to eject from the spacecraft after re-entry and parachute to the landing site.

The selection of Valentina Tereshkova for the flight was made by Premier Khrushchev. In addition to experience and fitness, qualifications included being an ideal Soviet citizen and model Communist Party member. On June 16th, Valentina rode Vostok 6

into orbit with the call sign “Chaika” (Seagull). The mission was not without incident and included space-sickness, leg cramps and other discomforts from being strapped into the capsule for three days. More importantly, the capsule ended up in the wrong orientation and, had it not been corrected, would not have allowed her to return to Earth.

Valentina’s three days in space was more flight time than all the American astronauts combined (at that time). After fulfilling her duties to her country, Tereshkova retired to a small house on the outskirts of Star City. The house was topped with a seagull weathervane, the call sign of her flight.

Twenty years later on June 18th, Sally Ride became the first American woman in space. Launched aboard the space shuttle Challenger, Sally served as the mission specialist on the five person crew.



An Extraordinary Feat
IF YOU HAVE EVER seen a Gemini space capsule (there is one on display at the Air and Space Museum in Washington, D.C.) it is difficult to comprehend how two people could have spent any length of time inside its cramped interior (Frank Borman and Jim Lovell spent 14 days or-



biting the Earth in Gemini 7). The reentry module, where the two astronauts sat, is approximately 11 feet long with a maximum diameter of 7½ feet and filled with instrumentation, life support systems and controls.

On June 3, 1965, Gemini 4 lifted off on a four day mission.

The highlight of the mission was to be a spacewalk by Ed White. NASA was very concerned with “putting guys in vacuums with nothing between them but that little old lady from Worcester, Massachusetts [the seamstress at the David Clark Company], and her glue pot and that suit.” However, the Soviets had challenged the United States with a spacewalk by Cosmonaut Alexei Leonov in March during a Voskhod II mission, and the United States did not want to appear to be falling behind its adversary.

After struggling with a faulty hatch, Ed White finally exited the spacecraft as it passed over the Pacific Ocean. Using a gun powered by compressed oxygen, he was able to maneuver outside the capsule, just avoiding the flaming thrusters of the Gemini capsule. After a 23 minute spacewalk, Jim



James A. McDivitt (foreground) and Edward H. White II inside their Gemini-4 spacecraft

McDivitt struggled to get the six foot tall Ed White back inside the capsule and close the balky door.

Unfortunately, after making history as the first American to walk in space, Ed White died during a test of the Apollo 1 spacecraft when the pure oxygen atmosphere exploded, killing all three astronauts inside.

Sunrise and Sunset

<u>Sun</u>	<u>Sunrise</u>	<u>Sunset</u>
June 1 st (EDT)	05:22	20:21
June 15 th	05:19	20:29
June 30 th	05:23	20:32

Summer Nights

For the more adventurous and sleep deprived individuals, the summer sky sparkles as twilight deepens and the summer Milky Way rises. The Milky Way is heralded by the three stars of the summer triangle Vega, Deneb and Altair. Appearing like a gossamer stream of stars, it flows across the night sky, emptying into the constellation Sagittarius. In our light-polluted skies, it may be

easier to see on nights when the Moon is absent (in the weeks preceding and following the New Moon on the 16th).

High in the June sky is the constellation Hercules. Shaped like a keystone or trapezoid, Hercules is home to one of the finest globular star clusters in the northern hemisphere. The Great Hercules Cluster (M13) is a collec-

tion of several hundred thousand stars located near the galactic core of the Milky Way Galaxy at a distance of approximately 25,000 light years. Hercules rises in the evening after the constellation Boötes with its bright star Arcturus and before the constellation Lyra with its bright star Vega. The cluster can be found on the side of the keystone asterism facing Boötes.

Astronomical and Historical Events

- 1st History: launch of the ROSAT (Röntgen) X-ray observatory; cooperative program between Germany, the United States, and United Kingdom; among its many discoveries was the detection of X-ray emissions from Comet Hyakutake (1990)
- 2nd Full Moon (Strawberry Moon)
- 2nd History: launch of the Mars Express spacecraft and ill-fated Beagle 2 lander (2003)
- 2nd History: launch of the Space Shuttle Discovery (STS-91); ninth and final Mir docking Astronomical and Historical Events (continued)
- 2nd History: launch of Soviet Venus orbiter Venera 15; side-looking radar provided high resolution mapping of surface in tandem with Venera 16 (1983)
- 2nd History: Gemini 5, Gemini 11, Apollo 12 and Skylab 2 astronaut Pete Conrad born (1930)
- 2nd History: discovery of Comet Donati by Italian astronomer Giovanni Battista Donati; brightest comet of the 19th century and first comet to be photographed (1858)
- 3rd History: launch of Gemini 4; Ed White becomes first American to walk in space (1965)
- 3rd History: launch of Gemini 9 with astronauts Thomas Stafford and Eugene Cernan (1966)
- 3rd History: dedication of the 200-inch Hale Telescope at Palomar Mountain (1948)
- 4th History: maiden flight of SpaceX's Falcon 9 rocket; launched from Cape Canaveral, Florida (2010)
- 5th Trans-Neptunian Object and potential dwarf planet 2010 KZ39 at Opposition (45.170 AU)
- 6th Venus at its Greatest Eastern Elongation (apparent separation from the Sun in the western sky) at 44°
- 6th History: launch of Soviet Venus orbiter Venera 16; side-looking radar provided high resolution mapping of surface in tandem with Venera 15 (1983)
- 8th Trans-Neptunian Object 174567 Varda at Opposition (46.139 AU)
- 8th History: New Horizons spacecraft, on its way to Pluto, crosses the orbit of Saturn (2008)
- 8th History: launch of Soviet Venus orbiter/lander Venera 9; transmitted the first black and white images of the surface of Venus (1975)
- 8th History: Giovanni Cassini born, observer of Mars, Jupiter and Saturn (1625)
- 9th Last Quarter Moon
- 9th History: dedication of the Kathleen Fischer Sundial at the McCarthy Observatory (2012)
- 10th Moon at perigee (closest distance from Earth)
- 10th History: launch of Mars Exploration Rover A (Spirit) in 2003
- 10th History: launch of Explorer 49, Moon orbiter and radio astronomy explorer (1973)
- 11th History: flyby of Venus by Soviet spacecraft Vega 1 on its way to Comet Halley; dropped off lander and a balloon to study middle cloud layers (1985)
- 12th Asteroid 2 Pallas at Opposition (8.6 Magnitude)
- 12th History: launch of Venera 4, Soviet Venus lander; first to enter atmosphere of another planet (1967)
- 13th History: return of the sample capsule from the Hayabusa (MUSES-C) spacecraft (2010)
- 13th **Second Saturday Stars/Open House at the McCarthy Observatory 8:00 to 10:00 pm**
- 14th Kuiper Belt Object and Plutino 28978 Ixion at Opposition (39.177 AU)
- 14th History: launch of Mariner 5; Venus flyby mission (1967)
- 14th History: launch of Venera 10; Soviet Venus orbiter/lander (1975)

Astronomical and Historical Events (continued)

- 15th History: flyby of Venus by Soviet spacecraft Vega 2 on its way to Comet Halley; dropped off lander and a balloon to study middle cloud layers (1985)
- 16th New Moon
- 16th Flyby of Saturn's moon *Dione* by the Cassini spacecraft
- 16th Distant flyby of Saturn's moons *Polydeuces*, *Methone*, *Pan*, *Atlas*, *Janus*, *Telesto* and *Titan* by the Cassini spacecraft
- 16th Asteroid 1566 Icarus Near-Earth Flyby (0.054 AU)
- 16th Centaur Object 5145 Pholus at Opposition (25.390 AU)
- 16th History: Liu Yang becomes the first Chinese woman in space aboard a Shenzhou-9 spacecraft, joining two other crew members on a thirteen day mission to the orbiting Tiangong 1 laboratory module (2012)
- 16th History: Valentina Tereshkova; first woman in space aboard Soviet Vostok 6 (1963)
- 17th History: discovery of the Dhofar 378 Mars Meteorite (2000)
- 18th Mars Spring Equinox in the Northern Hemisphere
- 18th History: launch of the Lunar Reconnaissance Orbiter (LRO) and Lunar CRater Observation and Sensing Satellite (LCROSS) to the Moon (2009)
- 18th History: Sally Ride becomes the first American woman in space aboard the Space Shuttle Challenger (1983)
- 19th Kuiper Belt Object 50000 Quaoar at Opposition (41.980 AU)
- 19th History: flyby of Earth by the ill-fated Nozomi spacecraft on its way to Mars (2003)
- 20th History: discovery of Nova 1670 in Vulpeculae (1670)
- 21st Summer Solstice at 16:38 UT (4:38 pm EDT)
- 22nd Centaur Object 10199 Chariklo at Opposition (14.105 AU)
- 22nd Centaur Object 10370 Hylonome at Opposition (22.041 AU)
- 22nd History: launch of Soviet space station Salyut 5 (1976)
- 22nd History: founding of the Royal Greenwich Observatory (1675)
- 22nd History: discovery of Pluto's largest moon *Charon* by Jim Christy (1978)
- 23rd Moon at apogee (furthest distance from Earth)
- 23rd Centaur Object 55576 Amycus at Opposition (18.223 AU)
- 24th First Quarter Moon
- 24th Mercury at its Greatest Western Elongation (apparent separation from the Sun in the morning sky) at 22°
- 24th History: launch of the Salyut 3 Soviet space station (1974)
- 24th History: Fred Hoyle born; British astronomer and proponent of nucleosynthesis (1915)
- 24th History: Sir William Huggins makes first photographic spectrum of a comet (1881)
- 25th History: Rupert Wildt born, German-American astronomer and first to hypothesize that the CO₂ in the Venusian atmosphere was responsible for the trapped heat (1905)
- 25th History: Hermann Oberth born, father of modern rocketry and space travel (1894)
- 26th History: Charles Messier born, famed comet hunter (1730)
- 27th History: discovery of the Mars meteorite SAU 060, a small 42.28 g partially crusted grey-greenish stone found near Sayh al Uhaymir in Oman (2001)
- 27th History: flyby of the asteroid *Mathilde* by the NEAR spacecraft (1997)
- 27th History: Space Shuttle Atlantis (STS-71) first docking with the Russian space station Mir (1995)
- 27th History: launch of SEASAT, the first Earth-orbiting satellite designed for remote sensing of the Earth's oceans (1978)
- 27th History: Alexis Bouvard born, French astronomer, director of Paris Observatory, postulated existence of eighth planet from discrepancies in his astronomical tables for Saturn and Uranus. Neptune was subsequently discovered by John Couch Adams and Urbain Le Verrier after his death where he had predicted (1767)
- 28th History: Nakhla meteorite fall in Egypt (Mars meteorite), a piece of which was claimed to have vaporized a dog; first direct evidence of aqueous processes on Mars; (1911)
- 29th History: George Ellery Hale born, founding father of the Mt. Wilson Observatory (1868)
- 30th Leap Second added to World's Clocks
- 30th Kuiper Belt Object 307261 (2002 MS₄) at Opposition; a Trans-Neptunian object discovered in 2002 by Chad Trujillo and Michael E. Brown (45.891 AU)
- 30th History: discovery of Haumea's moon Namaka, the smaller, inner moon of the dwarf planet, by Mike Brown, et al. (2005)
- 30th History: death of 3 cosmonauts in Soyuz 11 when capsule depressurizes on reentry – capsule was too cramped for cosmonauts to wear spacesuits (1971)
- 30th History: Tunguska Explosion Event (1908) 228th History: Nakhla meteorite fall in Egypt (Mars meteorite), a piece of which was claimed to have vaporized a dog; first direct evidence of aqueous processes on Mars; (1911)

References on Distances

- The apparent width of the Moon (and Sun) is approximately one-half a degree ($1/2^\circ$), less than the width of your little finger at arm's length which covers approximately one degree (1°); three fingers span approximately five degrees (5°)
- One astronomical unit (AU) is the distance from the Sun to the Earth or approximately 93 million miles

International Space Station/Space Shuttle/Iridium Satellites

Visit www.heavens-above.com for the times of visibility and detailed star charts for viewing the International Space Station, the Space Shuttle (when in orbit) and the bright flares from Iridium satellites.

Solar Activity

For the latest on what's happening on the Sun and the current forecast for flares and aurora, check out www.spaceweather.com.

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Page 3 Image: Globular cluster NGC 6637 is located in the constellation Sagittarius at a distance of approximately 29,700 light years. Globular clusters are a tightly bound group of stars that orbit the galactic core and can contain up to several hundred thousand members. Image credit: ESA/NASA

Second Saturday Stars poster: Sean Ross, Ross Designs

Second Saturday Stars

FREE EVENT

Every Month at the
John J. McCarthy Observatory
Behind the New Milford High School
860.946.0312
www.mccarthyobservatory.org

June 13th
8:00 - 10:00 pm

WHAT WE CAN LEARN
FROM THE
ROSETTA MISSION

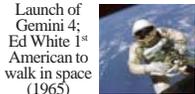
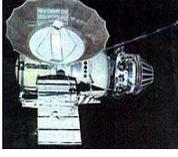
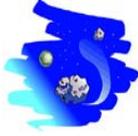
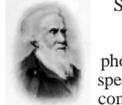
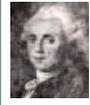
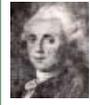


Refreshments
Family Entertainment
Activity Center
Stars & Planets
Rain or shine



June 2015

Celestial Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1  Launch of ROSAT (Röntgen) X-ray observatory (1990)	2  Full strawberry Moon  Launch of Soviet Venus Orbiter, Venera 15 to map surface of Venus, in tandem with Venera 16 (1983)  Launch of Mars Express spacecraft and ill-fated Beagle 2 lander. (2003)	3  200-inch Hale Telescope dedication (1948)  Gemini 9 launch, Thomas Stafford, Eugene Cernan. (1966)  Launch of Gemini 4; Ed White 1st American to walk in space (1965)	4  Maiden flight of Space X Falcon 9 rocket (2010)	5  Scheduled launch of the European Space Agency's fourth cargo-carrying Automated Transfer Vehicle (named Albert Einstein) aboard an Ariane 5 ES rocket from Kourou, French Guiana to the International Space Station	6  Venera 16 - last of Soviet Venus orbiter/lander missions to map Venusian landscape (1983)
7  "Three flames ate the sun, and big stars were seen." - etching on Chinese oracle bones indicating ancient solar eclipse, with three coronal streamers and stars visible in the darkened sky. (1302 BC)	8  Giovanni Cassini born, observer of Mars, Jupiter and Saturn (1625)  Launch of Venera 9, - 1st black/white images of surface of Venus (1975)	9  Dedication of the Kathleen Fischer Sundial at the McCarthy Observatory (2012)  Johann Gottfried Galle, German astronomer, born - first to view planet Neptune, using calculations of Urbain Le Verrier 1846. (1812)	10  Moon at Perigee (closest to earth)  Launch of Explorer 49 - moon orbiter and radio astronomy explorer (1973)  Launch of Mars Exploration Rover A Spirit (2003)	11  Flyby of Venus by Soviet spacecraft Vega 1 on its way to Comet Halley - dropped off lander and a balloon to study middle cloud layers (1985)	12  Launch of Venera 4, Soviet Venus lander, first to enter orbit of another planet (1967)	13  Return of sample capsule from the Hayabusa (MUSES-C) spacecraft, taken from near-Earth asteroid Itokawa (2010)  2nd Saturday Stars Open House McCarthy Observatory
14  Launch of Mariner 5, Venus flyby mission (1967) Launch of Venera 10, Soviet Venus orbiter/lander (1975)	15  flyby of Venus by Soviet spacecraft Vega 2 on its way to Comet Halley; dropped off lander and a balloon to study middle cloud layers (1985)	16  Liu Yang becomes the first Chinese woman in space (2012)  Valentina Tereshkova, 1st woman in space (1963)	17  Discovery of the Dhofar 378 Mars meteorite (2000)	18  Launch of Lunar Reconnaissance Orbiter and LCROSS satellite to Moon (2009)  Sally Ride, 1st U.S. woman in space (1983)	19  Flyby of Earth by the ill-fated Nozomi spacecraft on its way to Mars (2003)	20  Discovery of Nova 1670 in Vulpeculae by Pere Dom Voiture Anhelme, a Carthusian monk in Dijon, France (1670)
21  Summer Solstice 05:04 UT (1:04 AM EDT)  Yáng Lǐwēi, a Chinese major general, military pilot and a CNSA astronaut; was first man sent into space by the Chinese space program and his mission, Shenzhou 5, made China the third country to independently send people into space (1965)	22  Royal Greenwich Observatory founded (1675)  Discovery of Pluto's largest moon Charon by Jim Christy (1978)  Launch of Soviet space station Salyut 5 (1976)	23  Fred Hoyle born, British astronomer and proponent of nucleosynthesis (1915)  Martin John Rees born, British cosmologist and astrophysicist, has contributed to knowledge of the cosmic background radiation, galaxy clustering and formation, and on the final disproof of Steady State theory. (1942)  Sir William Huggins makes 1st photographic spectrum of a comet (1881)	24  Moon at Apogee (farthest from earth)  Rupert Wildt born, German astronomer (1905)  Hermann Oberth born, father of modern rocketry and space travel (1894)	25  German astronomer Walter Baade discovers near-earth asteroid 1566 Icarus inside orbit of Mercury, which became the subject of asteroid-busting "project Icarus." (1949)	26  Charles Messier born, famed comet hunter (1730)  Flyby of the asteroid Mathilde by the NEAR spacecraft (1997)	27  Alexis Bouvard born, postulated existence of 8th planet, later identified as Neptune (1767)  launch of SEASAT 1, first Earth-orbiting satellite designed for remote sensing of oceans (1978)
28  Nakhla meteor fall in Egypt - A piece of Mars object fabled to have hit dog (1911)	29  George Ellery Hale born, founding father of Mt. Wilson Observatory (1868)  Shuttle Atlantis docks with Russian space station Mir to form the largest man-made satellite ever to orbit the Earth - the second time ships from two countries had linked up in space (1995).	30  Death of 3 cosmonauts in Soyuz 11 when capsule depressurizes in reentry (1971)  Tunguska explosion event (1908)  Leap second added to world clocks	<h3>Phases of the Moon</h3>  <p>June 2 June 9 June 16 June 24</p>			